FIG.1 PRIOR ART

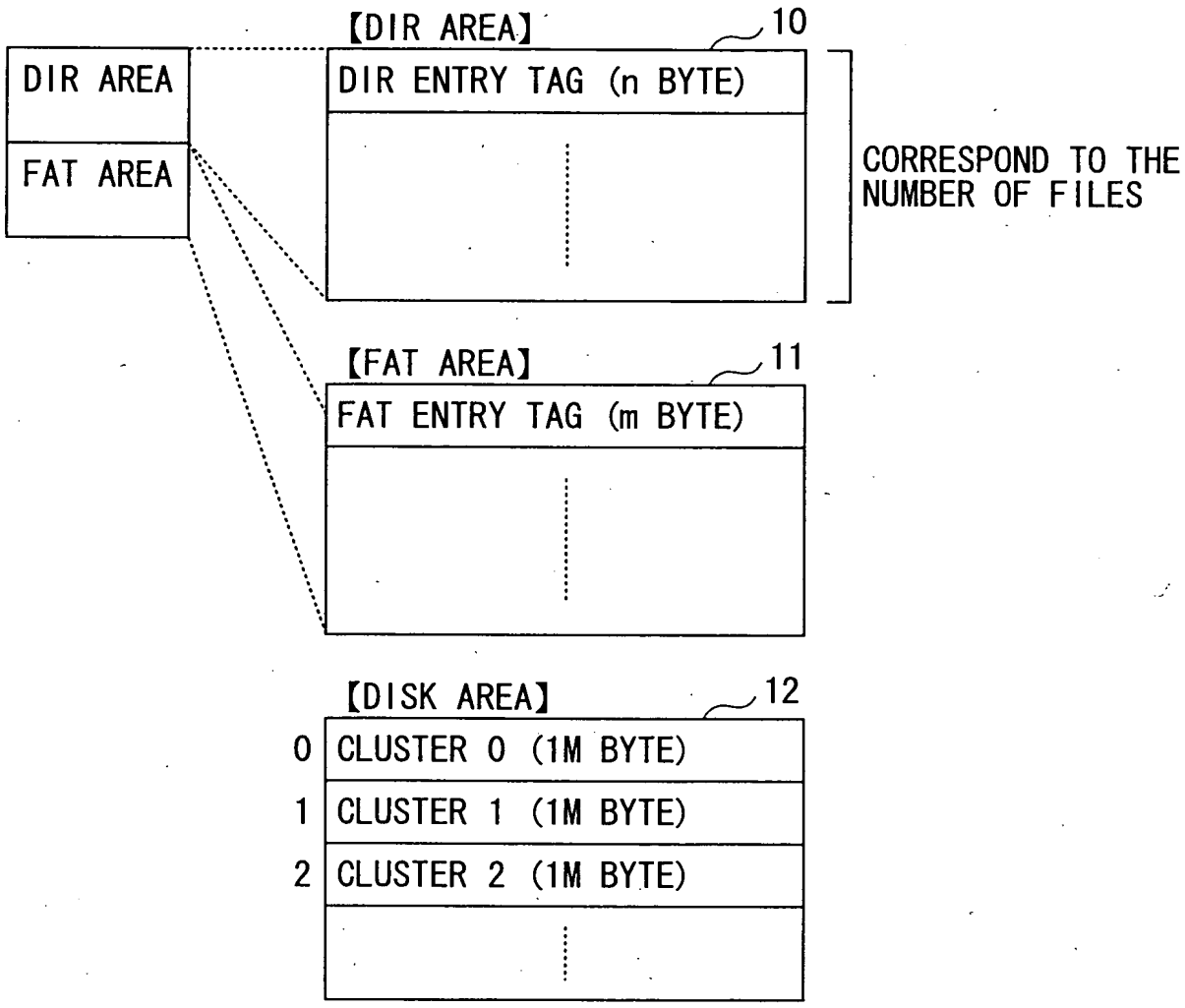

FIG.2 PRIOR ART

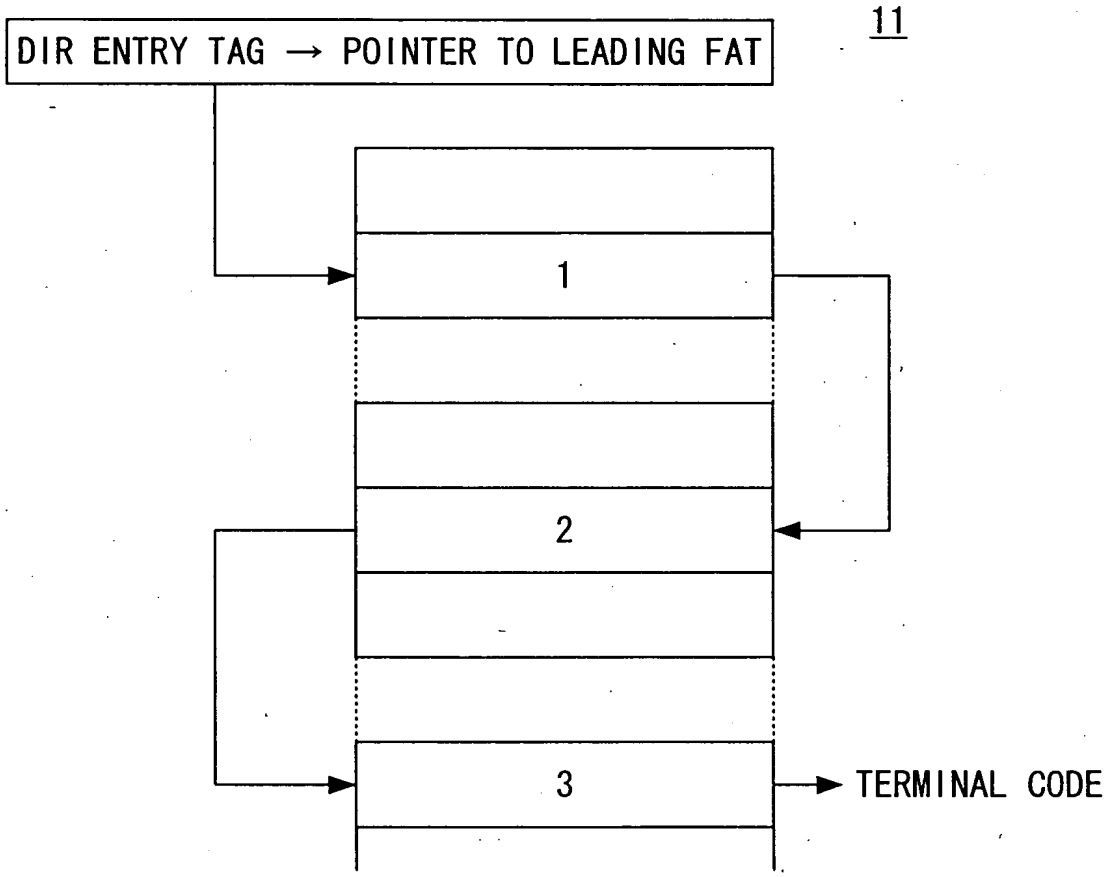

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FIG.3

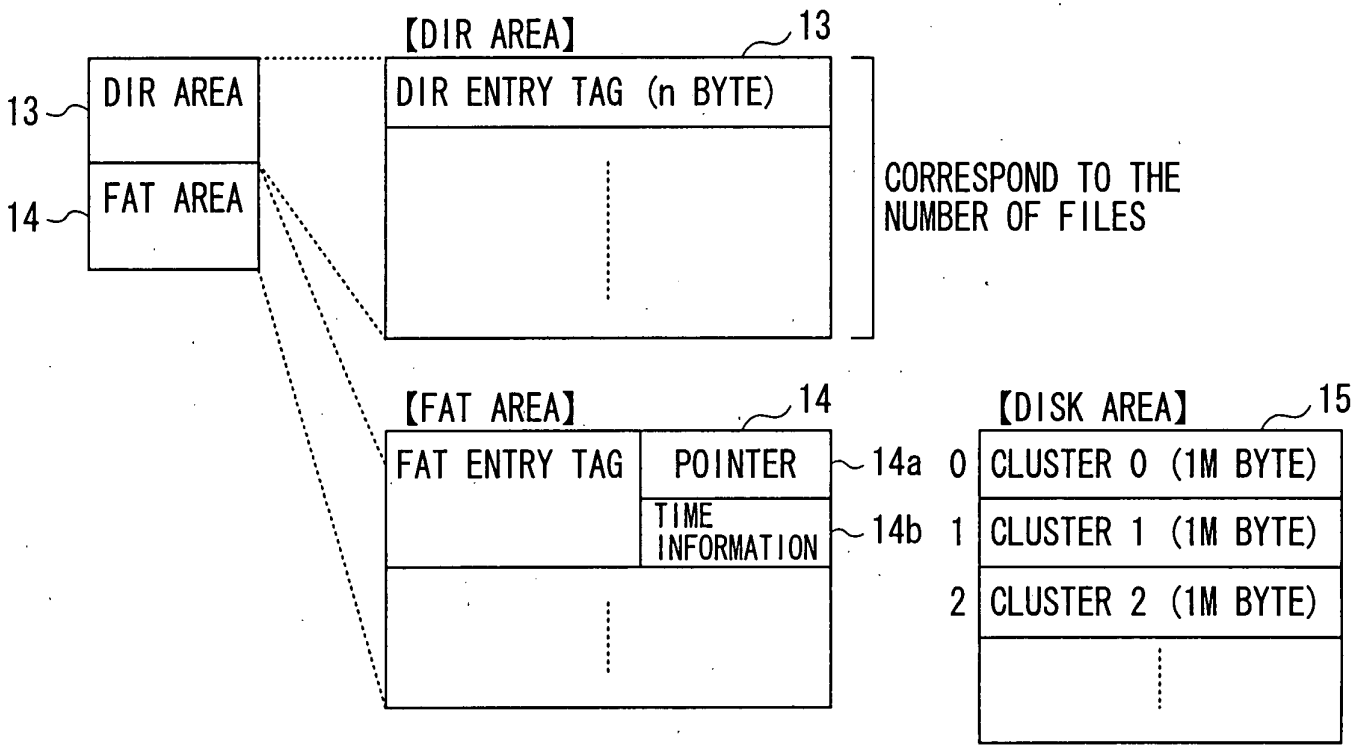


FIG.4

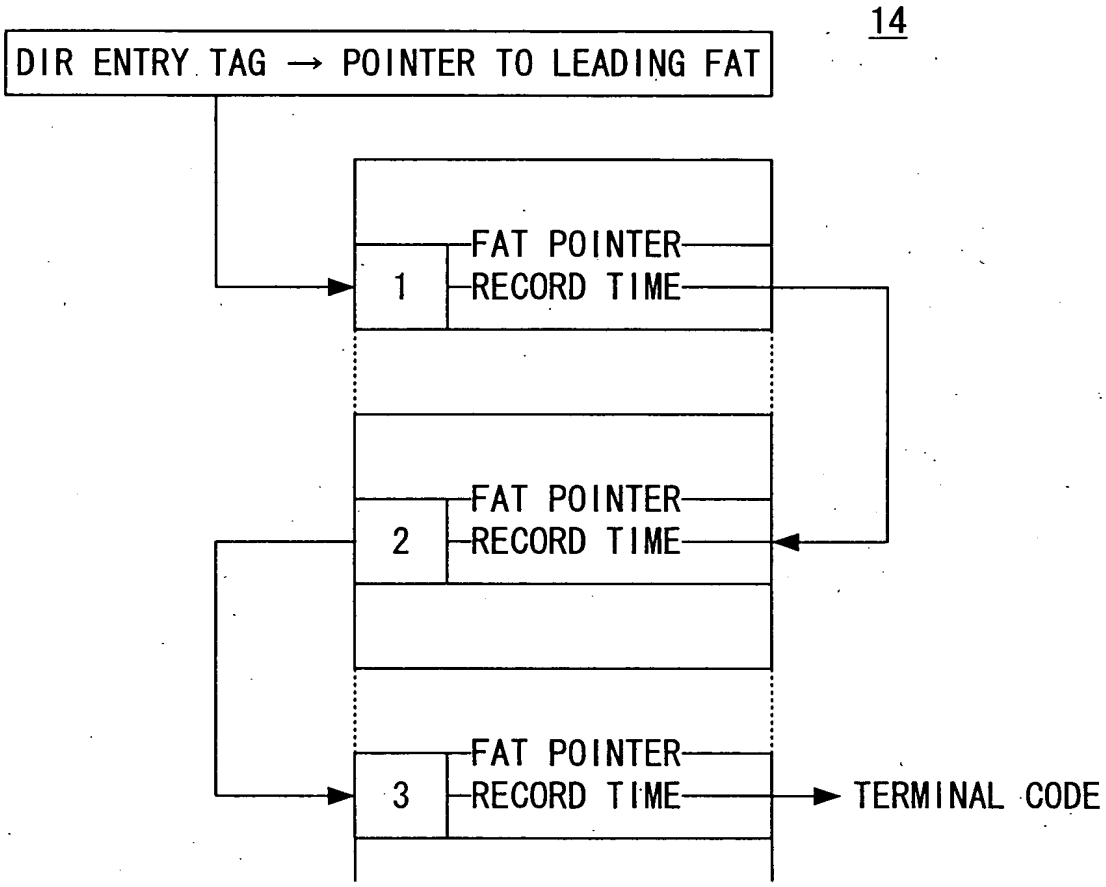

14
DIR ENTRY TAG → POINTER TO LEADING FAT
1
FAT POINTER
RECORD TIME
2
FAT POINTER
RECORD TIME
3
FAT POINTER
RECORD TIME
TERMINAL CODE

FIG.5

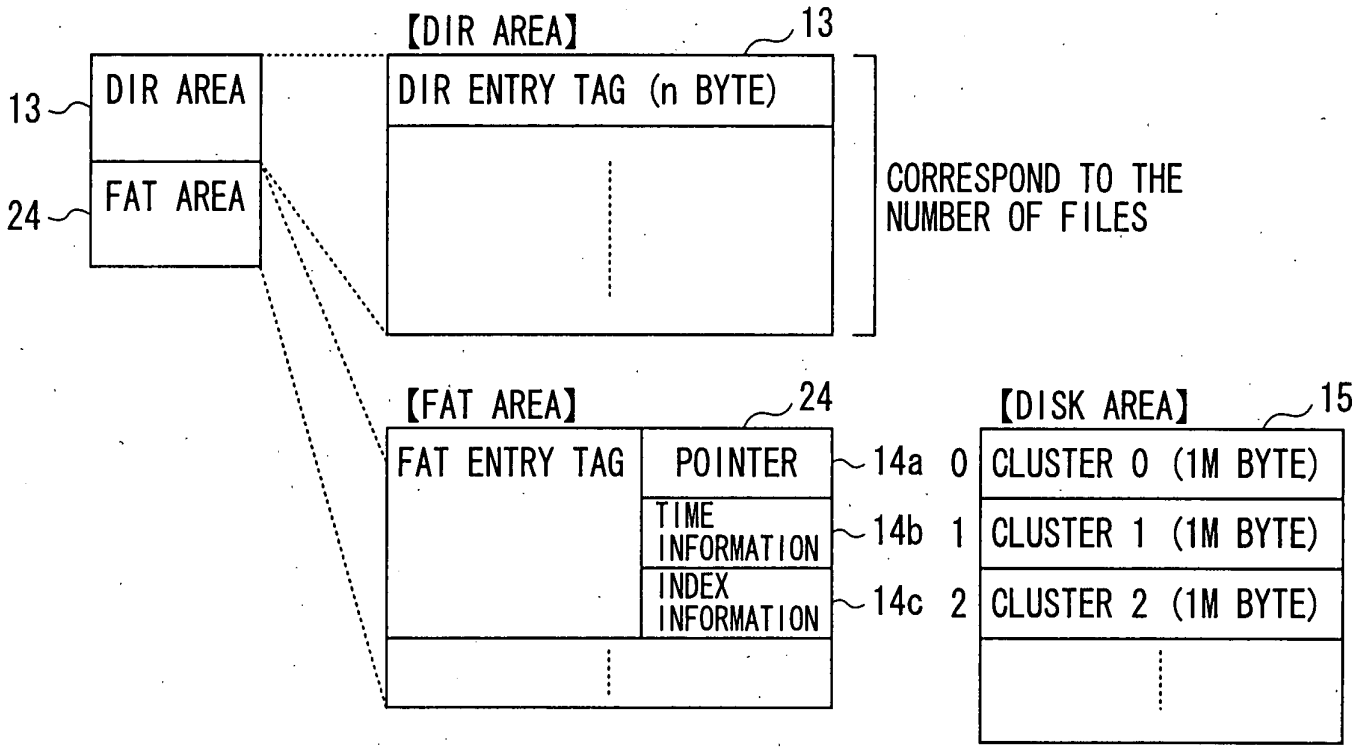

【DIR AREA】
13
DIR AREA
13
FAT AREA
24
DIR ENTRY TAG (n BYTE)
CORRESPOND TO THE NUMBER OF FILES
【FAT AREA】
24
FAT ENTRY TAG
POINTER
14a
TIME INFORMATION
14b
INDEX INFORMATION
14c
【DISK AREA】
15
0
CLUSTER 0 (1M BYTE)
1
CLUSTER 1 (1M BYTE)
2
CLUSTER 2 (1M BYTE)

FIG.6

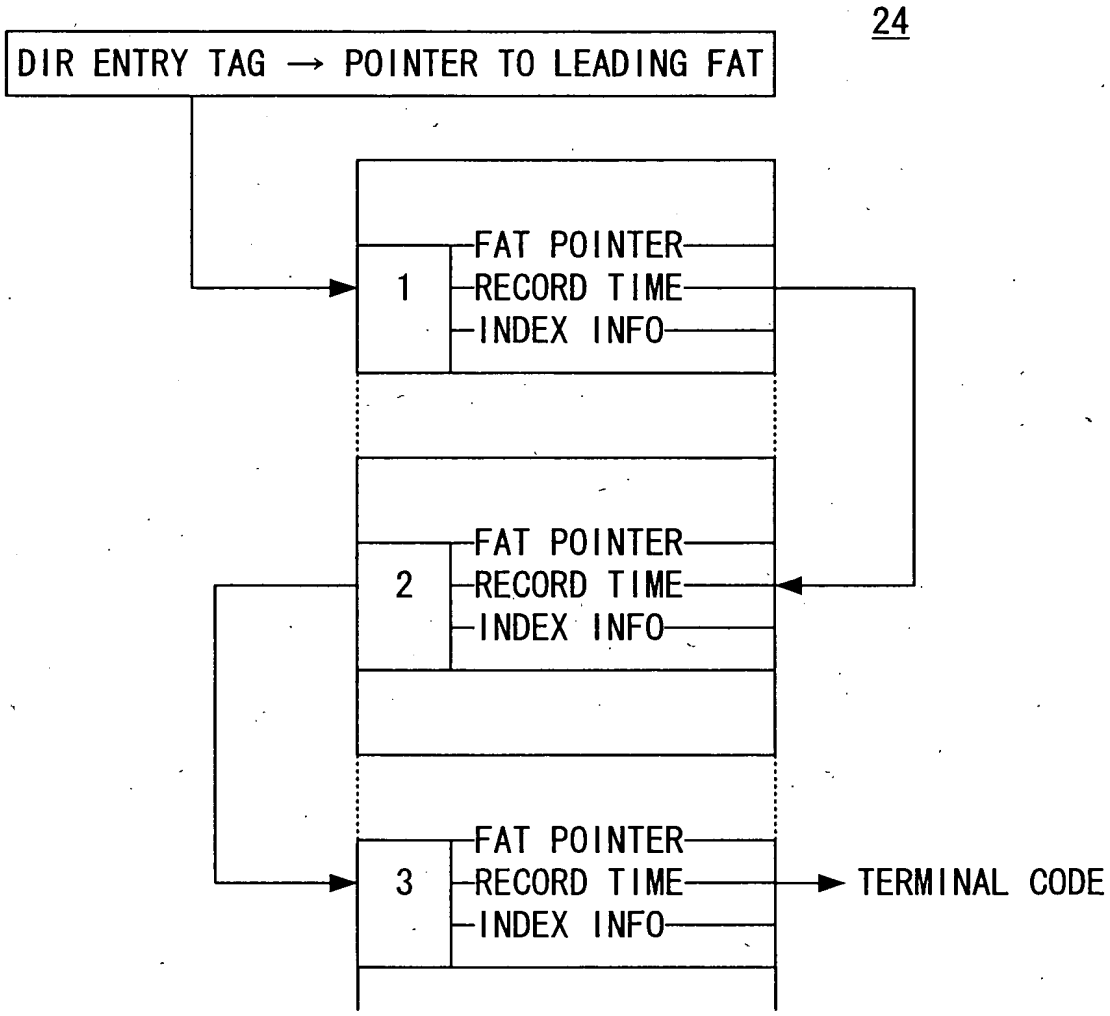

24
DIR ENTRY TAG → POINTER TO LEADING FAT
1
FAT POINTER
RECORD TIME
INDEX INFO
2
FAT POINTER
RECORD TIME
INDEX INFO
3
FAT POINTER
RECORD TIME
INDEX INFO
TERMINAL CODE

FIG.7

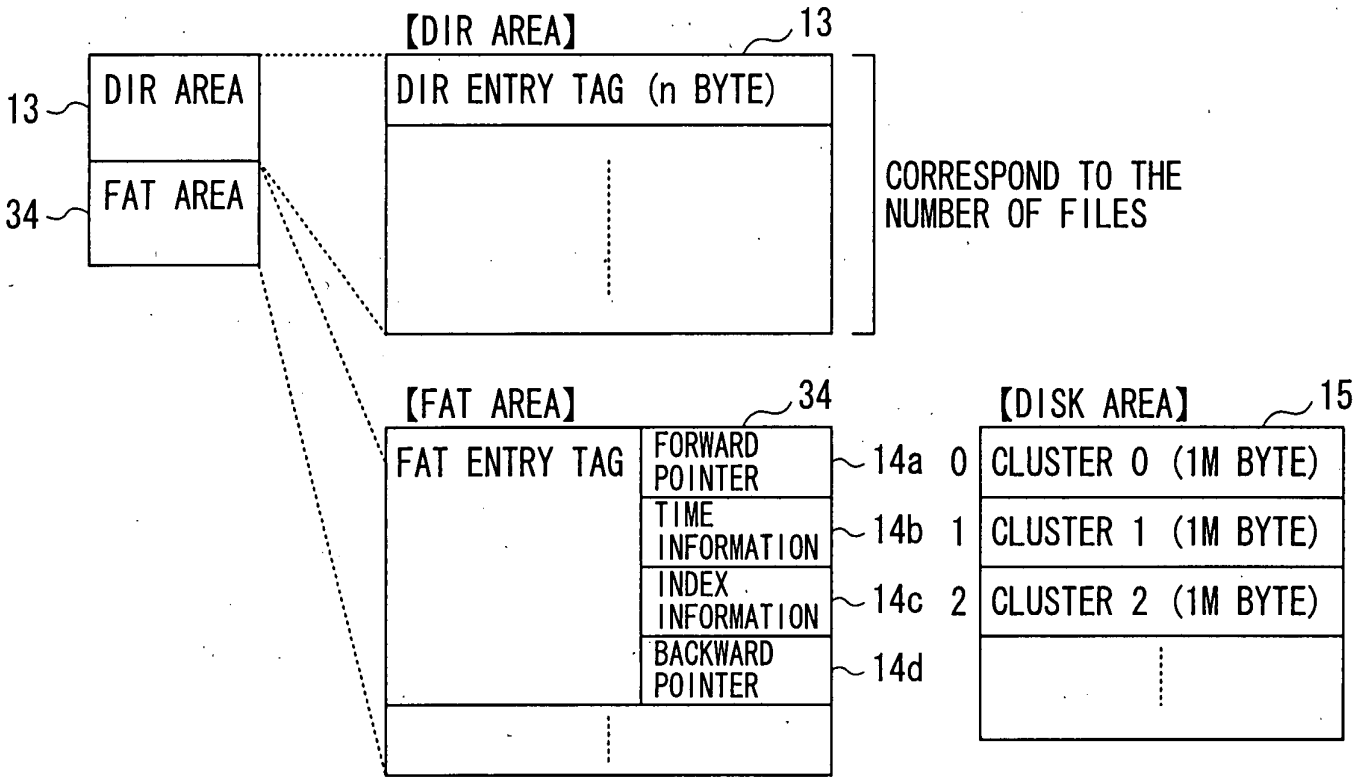

【DIR AREA】
13
DIR AREA
13
FAT AREA
34
DIR ENTRY TAG (n BYTE)
CORRESPOND TO THE NUMBER OF FILES
【FAT AREA】
34
FAT ENTRY TAG
FORWARD POINTER
14a
TIME INFORMATION
14b
INDEX INFORMATION
14c
BACKWARD POINTER
14d
【DISK AREA】
15
0
CLUSTER 0 (1M BYTE)
1
CLUSTER 1 (1M BYTE)
2
CLUSTER 2 (1M BYTE)

FIG.8

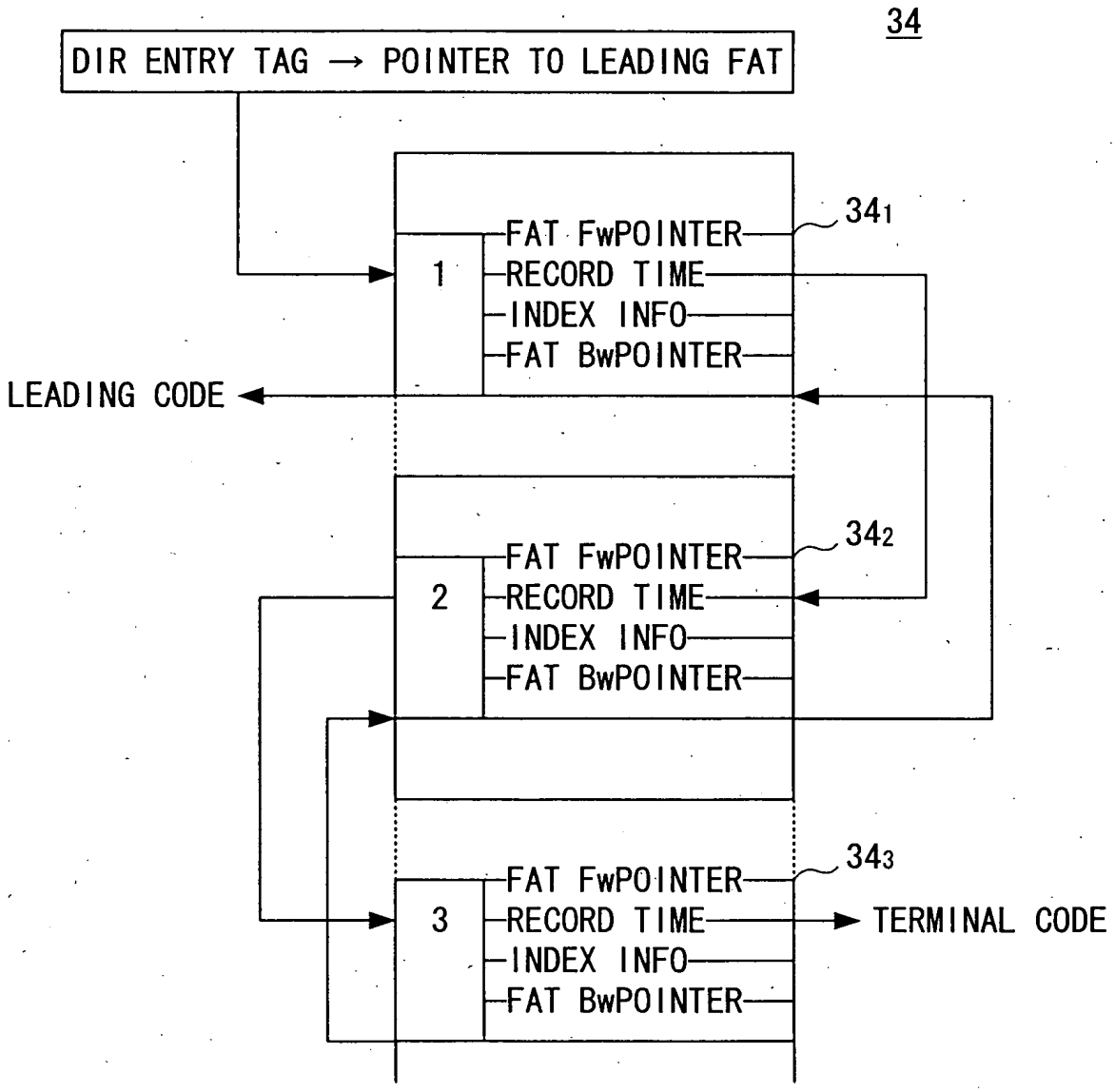

34
DIR ENTRY TAG → POINTER TO LEADING FAT
341
1
FAT FwPOINTER
RECORD TIME
INDEX INFO
FAT BwPOINTER
LEADING CODE
342
2
FAT FwPOINTER
RECORD TIME
INDEX INFO
FAT BwPOINTER
343
3
FAT FwPOINTER
RECORD TIME
INDEX INFO
FAT BwPOINTER
TERMINAL CODE

FIG.9

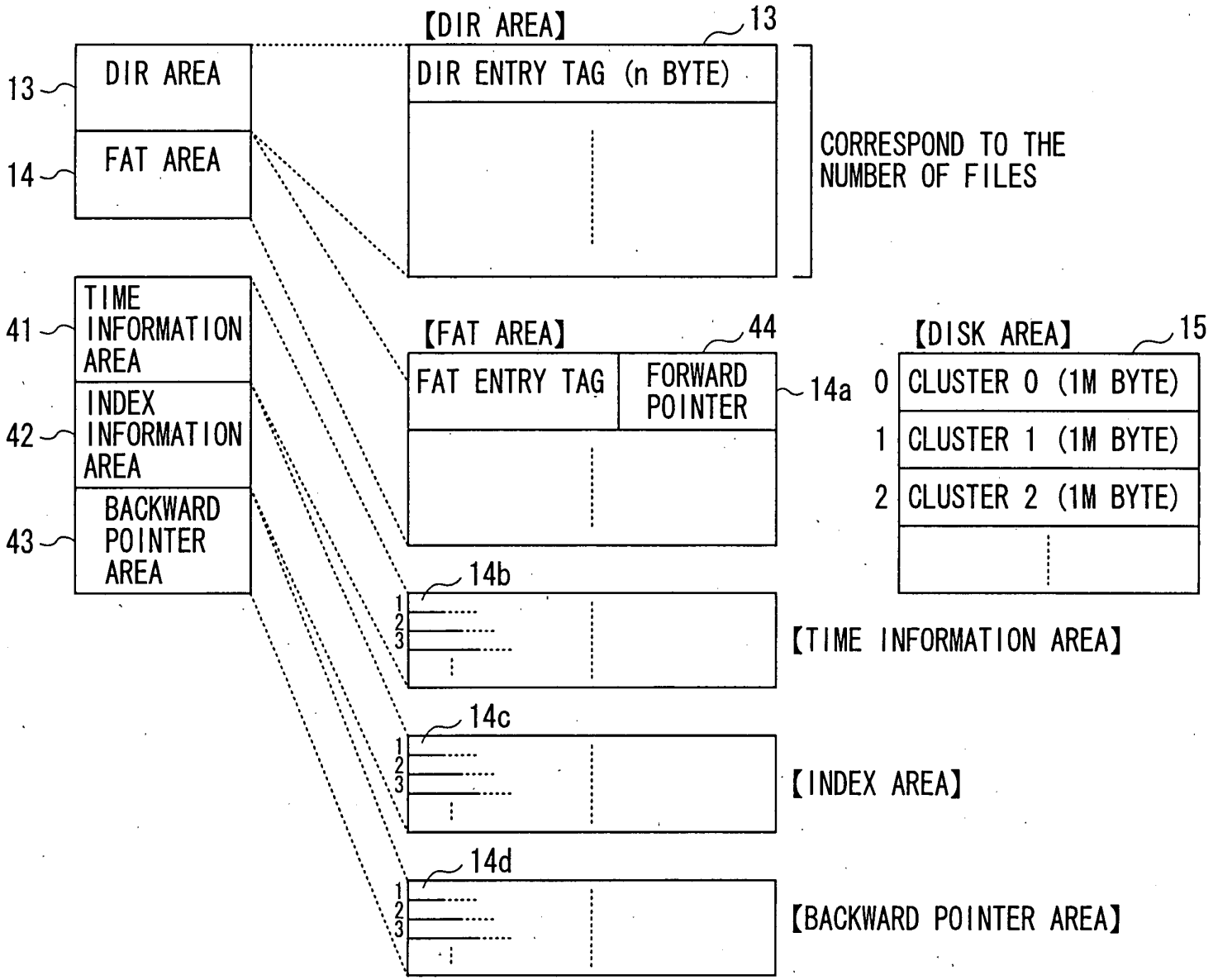

【DIR AREA】
13
DIR AREA
13
FAT AREA
14
DIR ENTRY TAG (n BYTE)
CORRESPOND TO THE NUMBER OF FILES
TIME INFORMATION AREA
41
INDEX INFORMATION AREA
42
BACKWARD POINTER AREA
43
【FAT AREA】
44
FAT ENTRY TAG
FORWARD POINTER
14a
【DISK AREA】
15
0 CLUSTER 0 (1M BYTE)
1 CLUSTER 1 (1M BYTE)
2 CLUSTER 2 (1M BYTE)
14b
【TIME INFORMATION AREA】
14c
【INDEX AREA】
14d
【BACKWARD POINTER AREA】

FIG.10

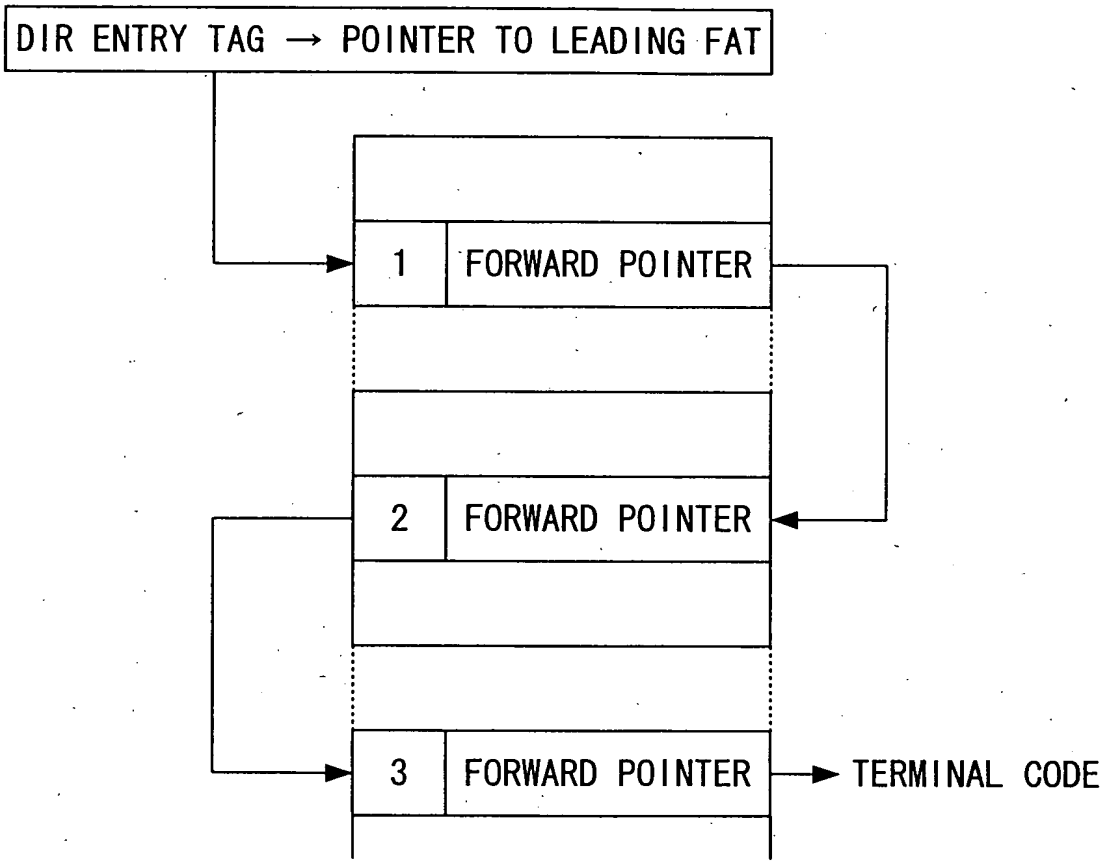

DIR ENTRY TAG → POINTER TO LEADING FAT
1
FORWARD POINTER
2
FORWARD POINTER
3
FORWARD POINTER
TERMINAL CODE

FIG.11

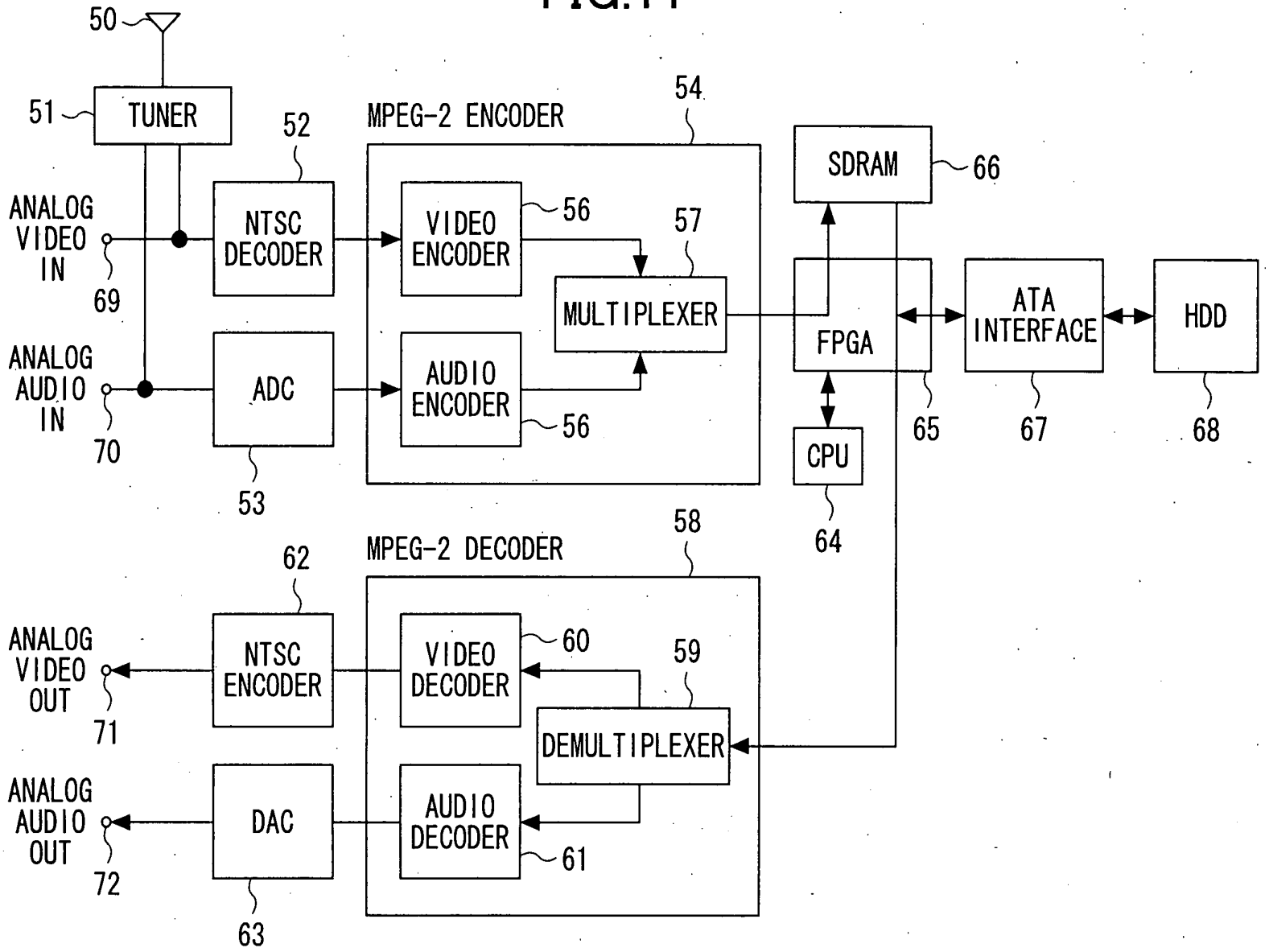

50
51
TUNER
52
MPEG-2 ENCODER
54
SDRAM
66
ANALOG VIDEO IN
69
NTSC DECODER
VIDEO ENCODER
56
57
MULTIPLEXER
ANALOG AUDIO IN
70
ADC
AUDIO ENCODER
56
FPGA
ATA INTERFACE
HDD
53
CPU
64
65
67
68
58
MPEG-2 DECODER
62
ANALOG VIDEO OUT
71
NTSC ENCODER
VIDEO DECODER
60
59
DEMULTIPLEXER
ANALOG AUDIO OUT
72
DAC
AUDIO DECODER
61
63

FIG.12

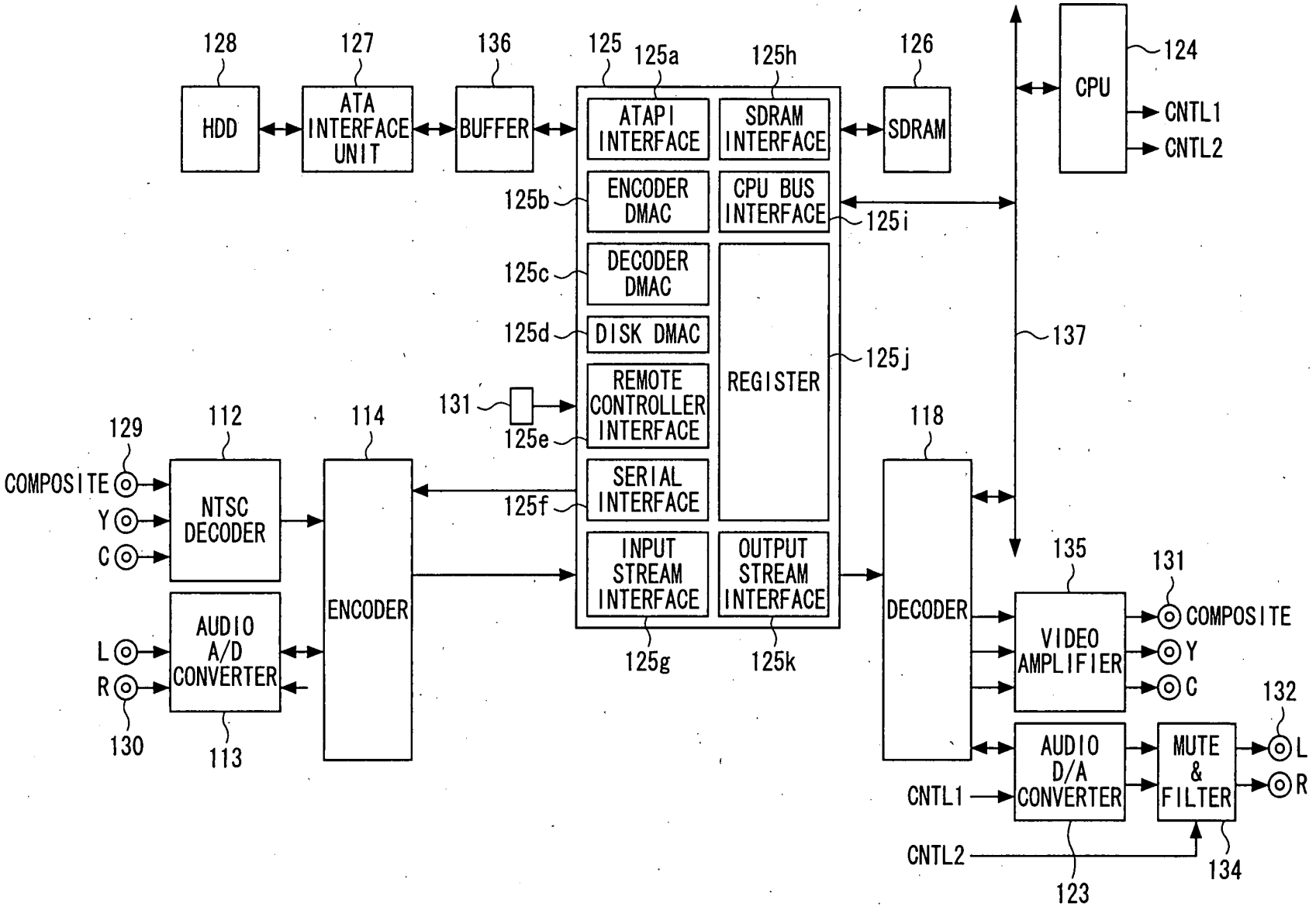

128
HDD
127
ATA INTERFACE UNIT
136
BUFFER
125
125a
ATAPI INTERFACE
125h
SDRAM INTERFACE
126
SDRAM
CPU
124
CNTL1
CNTL2
125b
ENCODER DMAC
CPU BUS INTERFACE
125i
125c
DECODER DMAC
125d
DISK DMAC
REGISTER
125j
137
131
REMOTE CONTROLLER INTERFACE
125e
129
112
114
118
COMPOSITE
Y
C
NTSC DECODER
SERIAL INTERFACE
125f
ENCODER
INPUT STREAM INTERFACE
OUTPUT STREAM INTERFACE
125g
125k
DECODER
135
131
VIDEO AMPLIFIER
COMPOSITE
Y
C
L
R
AUDIO A/D CONVERTER
130
113
132
AUDIO D/A CONVERTER
MUTE & FILTER
L
R
CNTL1
CNTL2
123
134

FIG.13

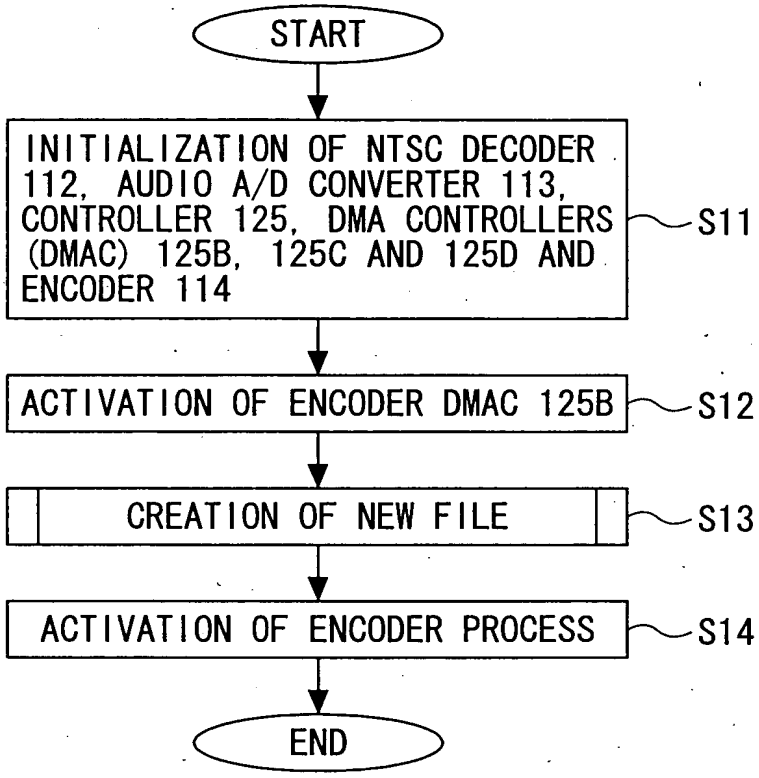

START
INITIALIZATION OF NTSC DECODER 112, AUDIO A/D CONVERTER 113, CONTROLLER 125, DMA CONTROLLERS (DMAC) 125B, 125C AND 125D AND ENCODER 114
S11
ACTIVATION OF ENCODER DMAC 125B
S12
CREATION OF NEW FILE
S13
ACTIVATION OF ENCODER PROCESS
S14
END

FIG.14

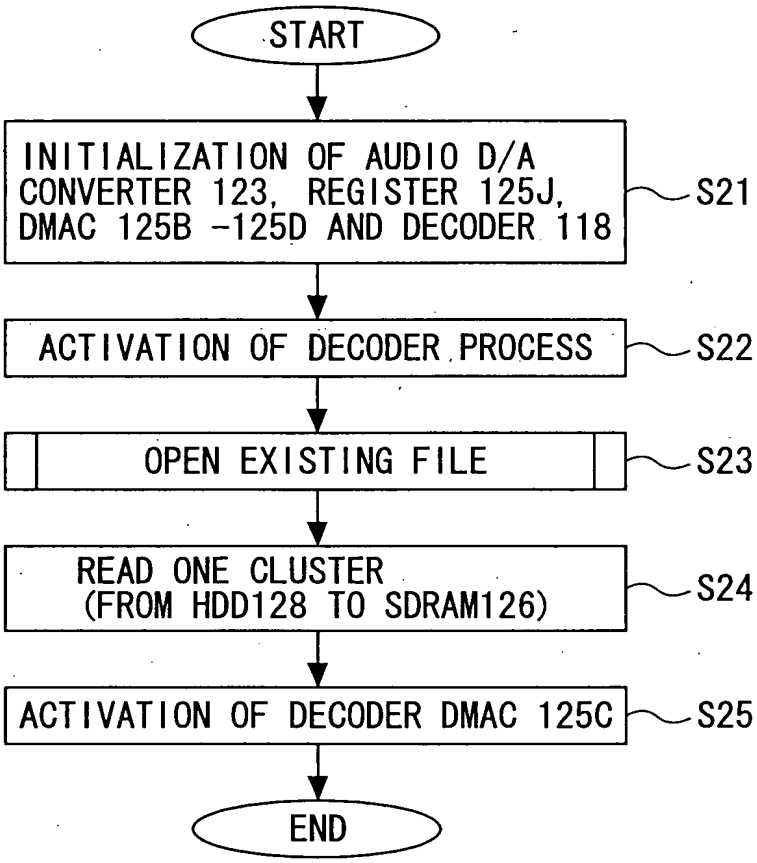

START
INITIALIZATION OF AUDIO D/A CONVERTER 123, REGISTER 125J, DMAC 125B -125D AND DECODER 118
S21
ACTIVATION OF DECODER PROCESS
S22
OPEN EXISTING FILE
S23
READ ONE CLUSTER (FROM HDD128 TO SDRAM126)
S24
ACTIVATION OF DECODER DMAC 125C
S25
END

FIG.15

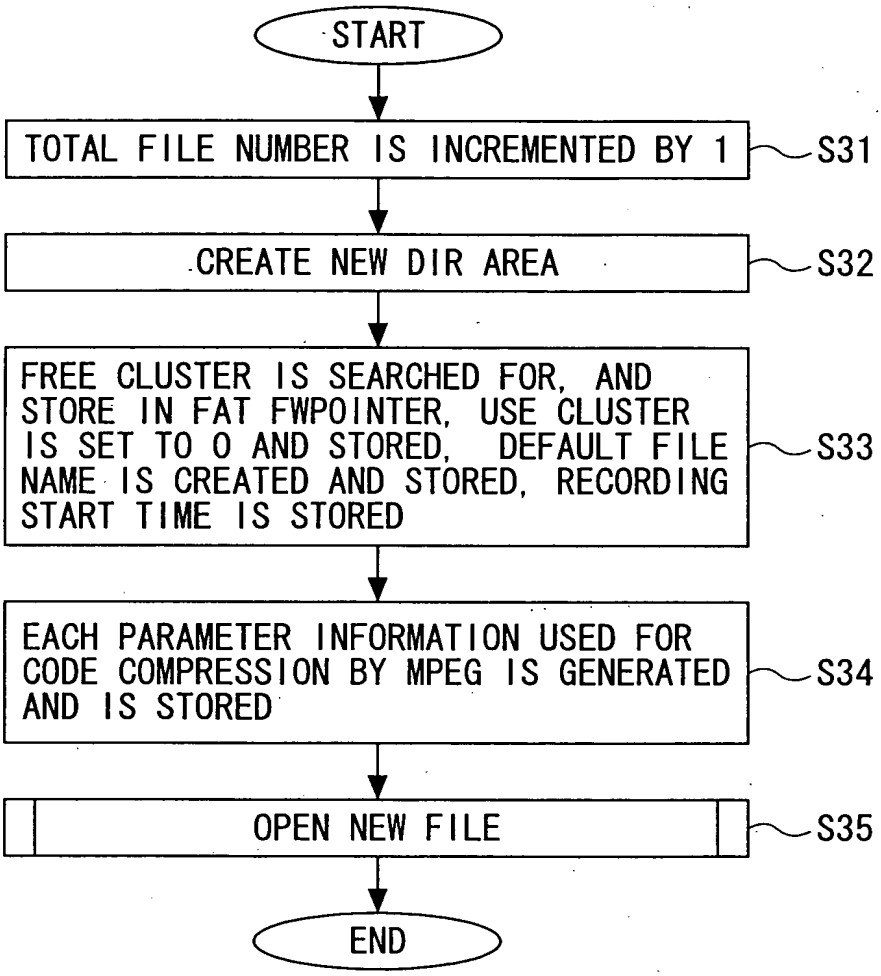

START
TOTAL FILE NUMBER IS INCREMENTED BY 1
S31
CREATE NEW DIR AREA
S32
FREE CLUSTER IS SEARCHED FOR, AND STORE IN FAT FWPOINTER, USE CLUSTER IS SET TO 0 AND STORED, DEFAULT FILE NAME IS CREATED AND STORED, RECORDING START TIME IS STORED
S33
EACH PARAMETER INFORMATION USED FOR CODE COMPRESSION BY MPEG IS GENERATED AND IS STORED
S34
OPEN NEW FILE
S35
END

FIG.16

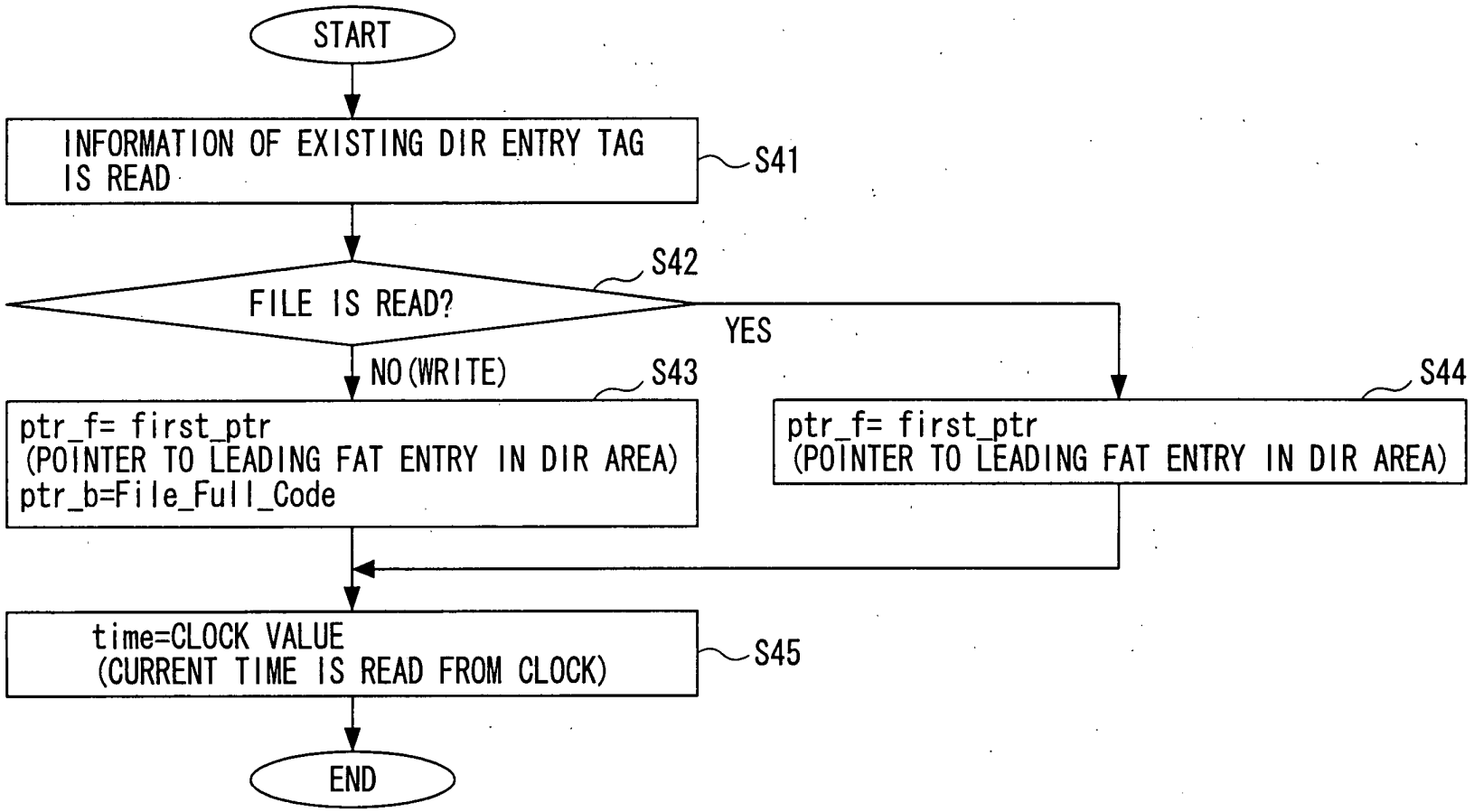

START
INFORMATION OF EXISTING DIR ENTRY TAG IS READ
S41
S42
FILE IS READ?
YES
NO(WRITE)
S43
S44
ptr_f= first_ptr
(POINTER TO LEADING FAT ENTRY IN DIR AREA)
ptr_b=File_Full_Code
ptr_f= first_ptr
(POINTER TO LEADING FAT ENTRY IN DIR AREA)
time=CLOCK VALUE
(CURRENT TIME IS READ FROM CLOCK)
S45
END

FIG.17

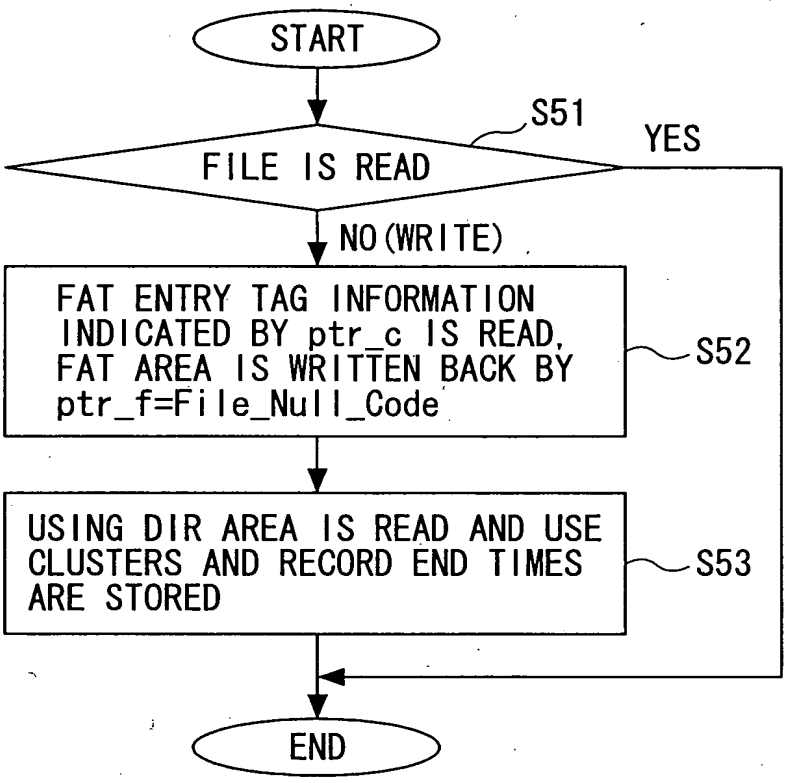

START
S51
FILE IS READ
YES
NO(WRITE)
FAT ENTRY TAG INFORMATION INDICATED BY ptr_c IS READ, FAT AREA IS WRITTEN BACK BY ptr_f=File_Null_Code
S52
USING DIR AREA IS READ AND USE CLUSTERS AND RECORD END TIMES ARE STORED
S53
END

FIG.18

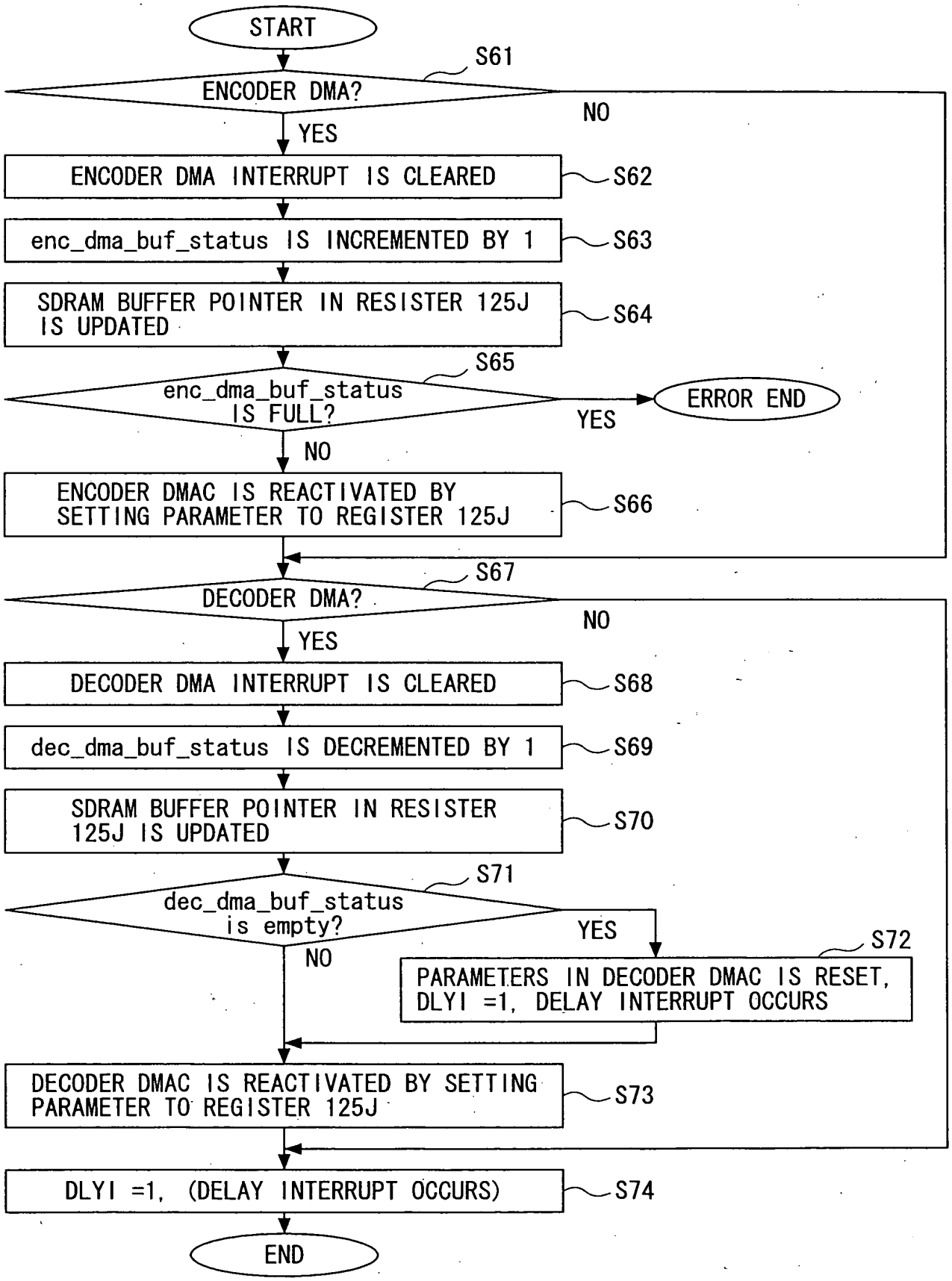

START
S61
ENCODER DMA?
NO
YES
ENCODER DMA INTERRUPT IS CLEARED
S62
enc_dma_buf_status IS INCREMENTED BY 1
S63
SDRAM BUFFER POINTER IN RESISTER 125J IS UPDATED
S64
S65
enc_dma_buf_status IS FULL?
YES
ERROR END
NO
ENCODER DMAC IS REACTIVATED BY SETTING PARAMETER TO REGISTER 125J
S66
S67
DECODER DMA?
NO
YES
DECODER DMA INTERRUPT IS CLEARED
S68
dec_dma_buf_status IS DECREMENTED BY 1
S69
SDRAM BUFFER POINTER IN RESISTER 125J IS UPDATED
S70
S71
dec_dma_buf_status is empty?
YES
NO
S72
PARAMETERS IN DECODER DMAC IS RESET, DLYI =1, DELAY INTERRUPT OCCURS
DECODER DMAC IS REACTIVATED BY SETTING PARAMETER TO REGISTER 125J
S73
DLYI =1, (DELAY INTERRUPT OCCURS)
S74
END

FIG.19

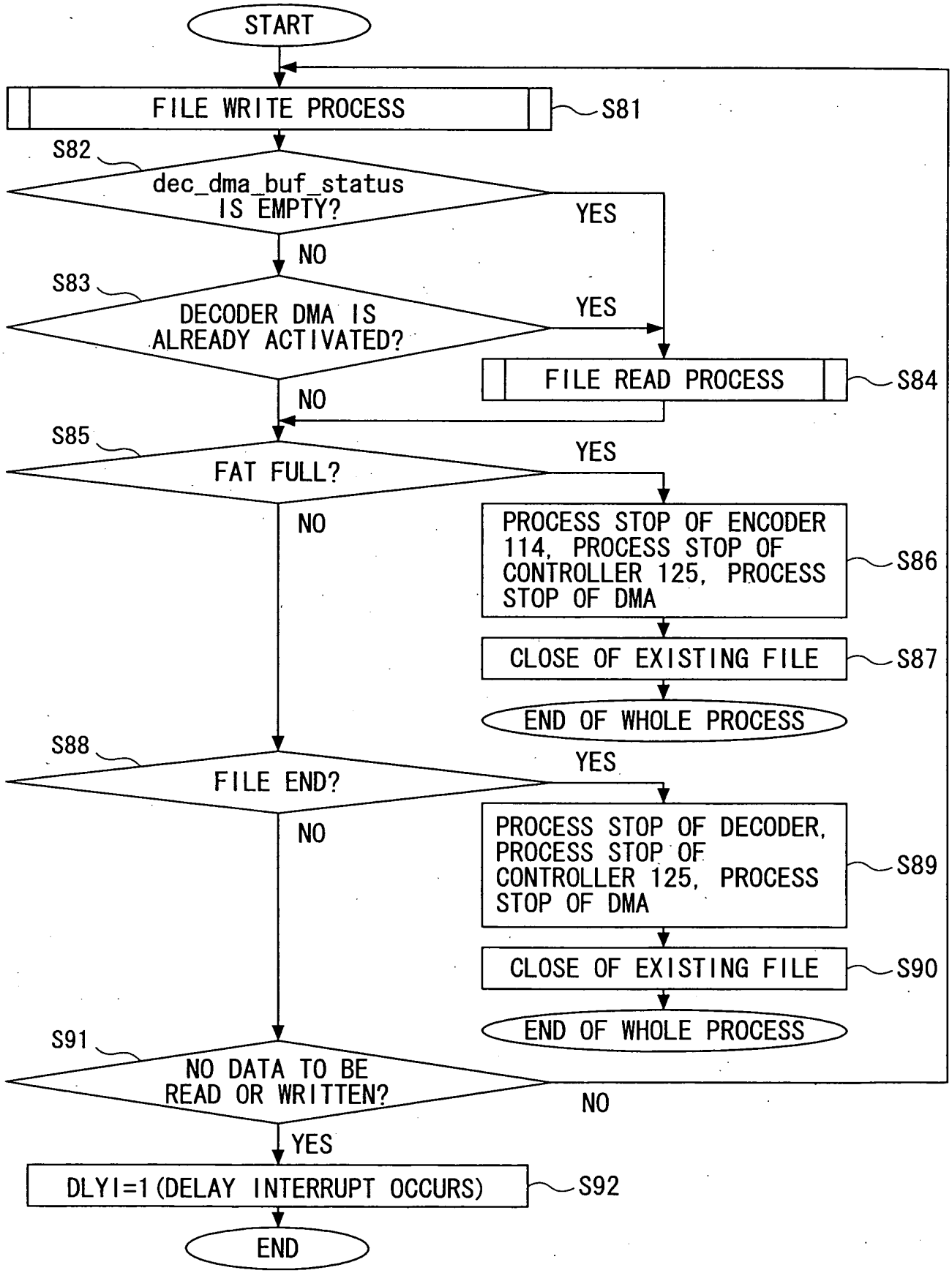

START
FILE WRITE PROCESS
S81
S82
dec_dma_buf_status IS EMPTY?
YES
NO
S83
DECODER DMA IS ALREADY ACTIVATED?
YES
FILE READ PROCESS
S84
NO
S85
FAT FULL?
YES
NO
PROCESS STOP OF ENCODER 114, PROCESS STOP OF CONTROLLER 125, PROCESS STOP OF DMA
S86
CLOSE OF EXISTING FILE
S87
END OF WHOLE PROCESS
S88
FILE END?
YES
NO
PROCESS STOP OF DECODER, PROCESS STOP OF CONTROLLER 125, PROCESS STOP OF DMA
S89
CLOSE OF EXISTING FILE
S90
END OF WHOLE PROCESS
S91
NO DATA TO BE READ OR WRITTEN?
NO
YES
DLYI=1(DELAY INTERRUPT OCCURS)
S92
END

FIG.20

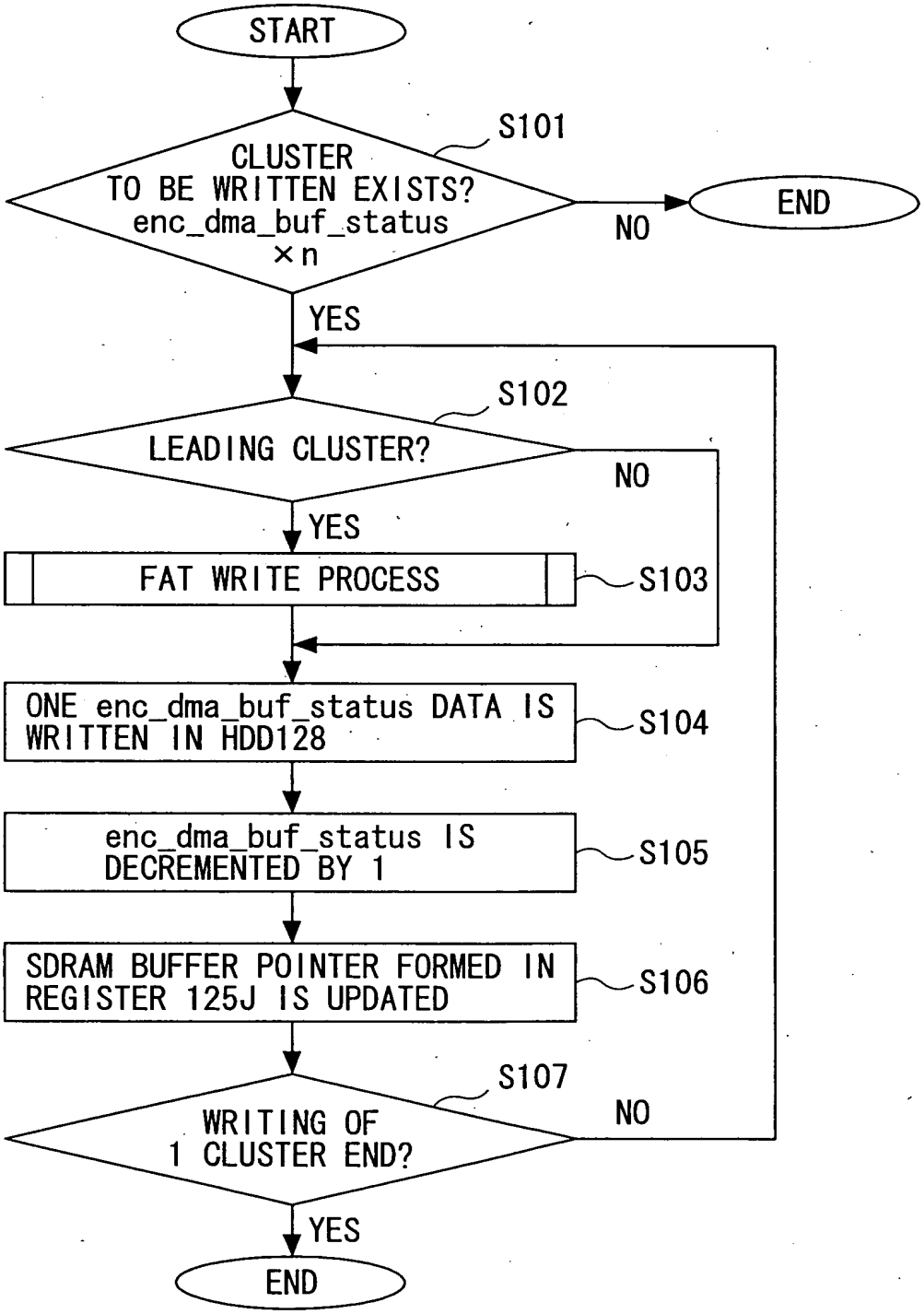

START
S101
CLUSTER TO BE WRITTEN EXISTS? enc_dma_buf_status ×n
NO
END
YES
S102
LEADING CLUSTER?
NO
YES
FAT WRITE PROCESS
S103
ONE enc_dma_buf_status DATA IS WRITTEN IN HDD128
S104
enc_dma_buf_status IS DECREMENTED BY 1
S105
SDRAM BUFFER POINTER FORMED IN REGISTER 125J IS UPDATED
S106
S107
WRITING OF 1 CLUSTER END?
NO
YES
END

FIG.21

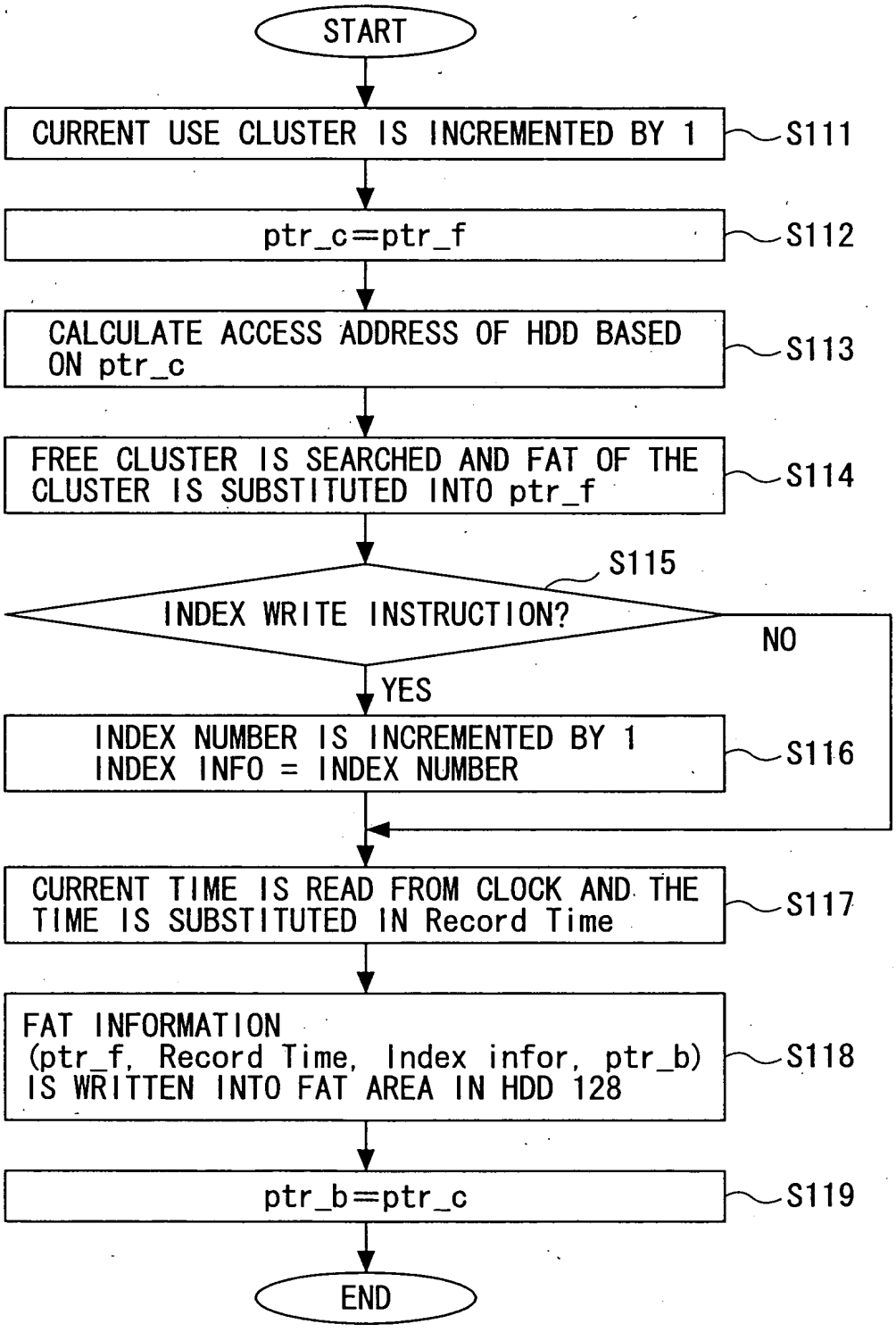

START
CURRENT USE CLUSTER IS INCREMENTED BY 1
S111
ptr_c=ptr_f
S112
CALCULATE ACCESS ADDRESS OF HDD BASED ON ptr_c
S113
FREE CLUSTER IS SEARCHED AND FAT OF THE CLUSTER IS SUBSTITUTED INTO ptr_f
S114
S115
INDEX WRITE INSTRUCTION?
NO
YES
INDEX NUMBER IS INCREMENTED BY 1
INDEX INFO = INDEX NUMBER
S116
CURRENT TIME IS READ FROM CLOCK AND THE TIME IS SUBSTITUTED IN Record Time
S117
FAT INFORMATION
(ptr_f, Record Time, Index infor, ptr_b)
IS WRITTEN INTO FAT AREA IN HDD 128
S118
ptr_b=ptr_c
S119
END

FIG.22

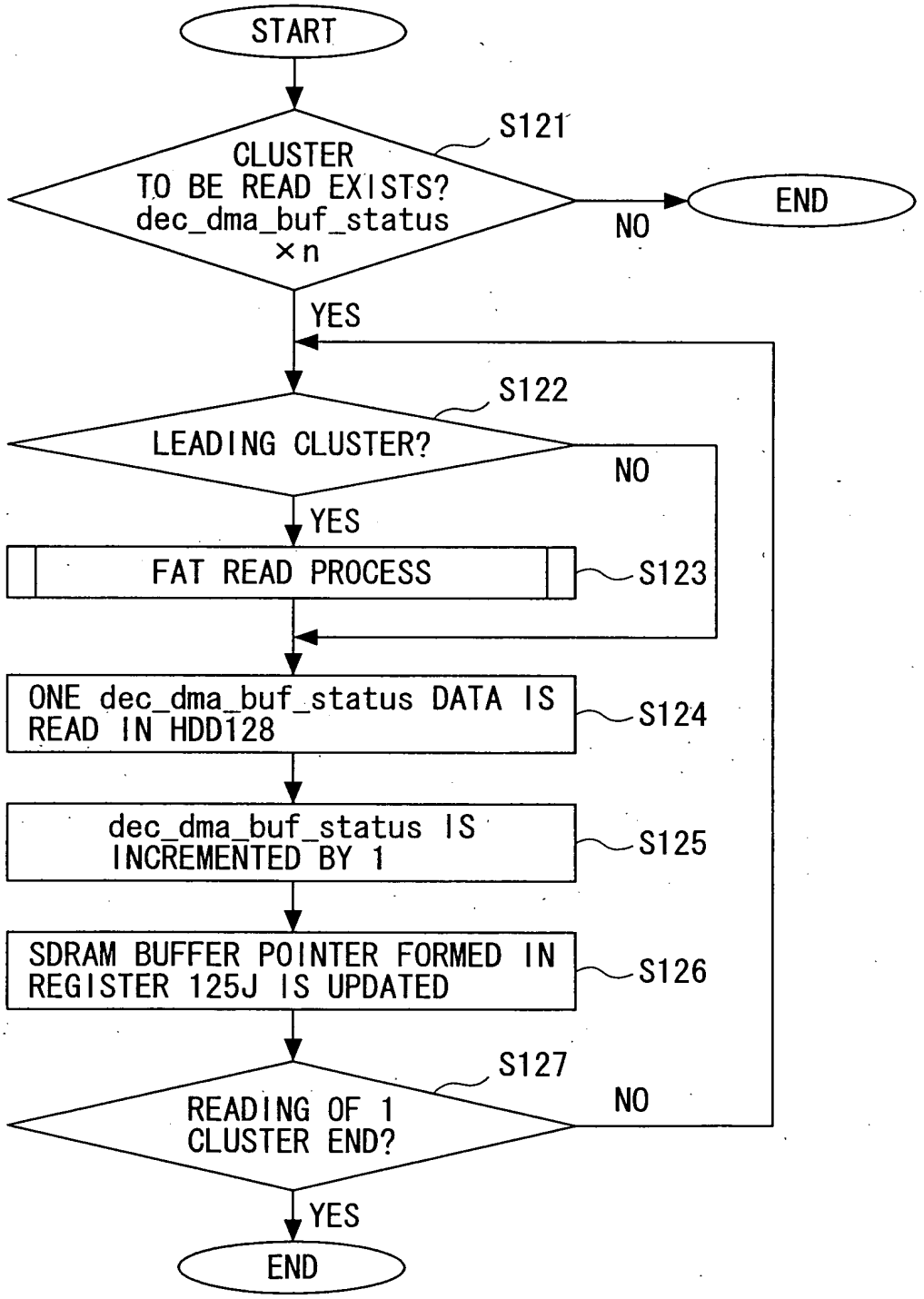

START
S121
CLUSTER TO BE READ EXISTS? dec_dma_buf_status ×n
NO
END
YES
S122
LEADING CLUSTER?
NO
YES
FAT READ PROCESS
S123
ONE dec_dma_buf_status DATA IS READ IN HDD128
S124
dec_dma_buf_status IS INCREMENTED BY 1
S125
SDRAM BUFFER POINTER FORMED IN REGISTER 125J IS UPDATED
S126
S127
READING OF 1 CLUSTER END?
NO
YES
END

FIG.23

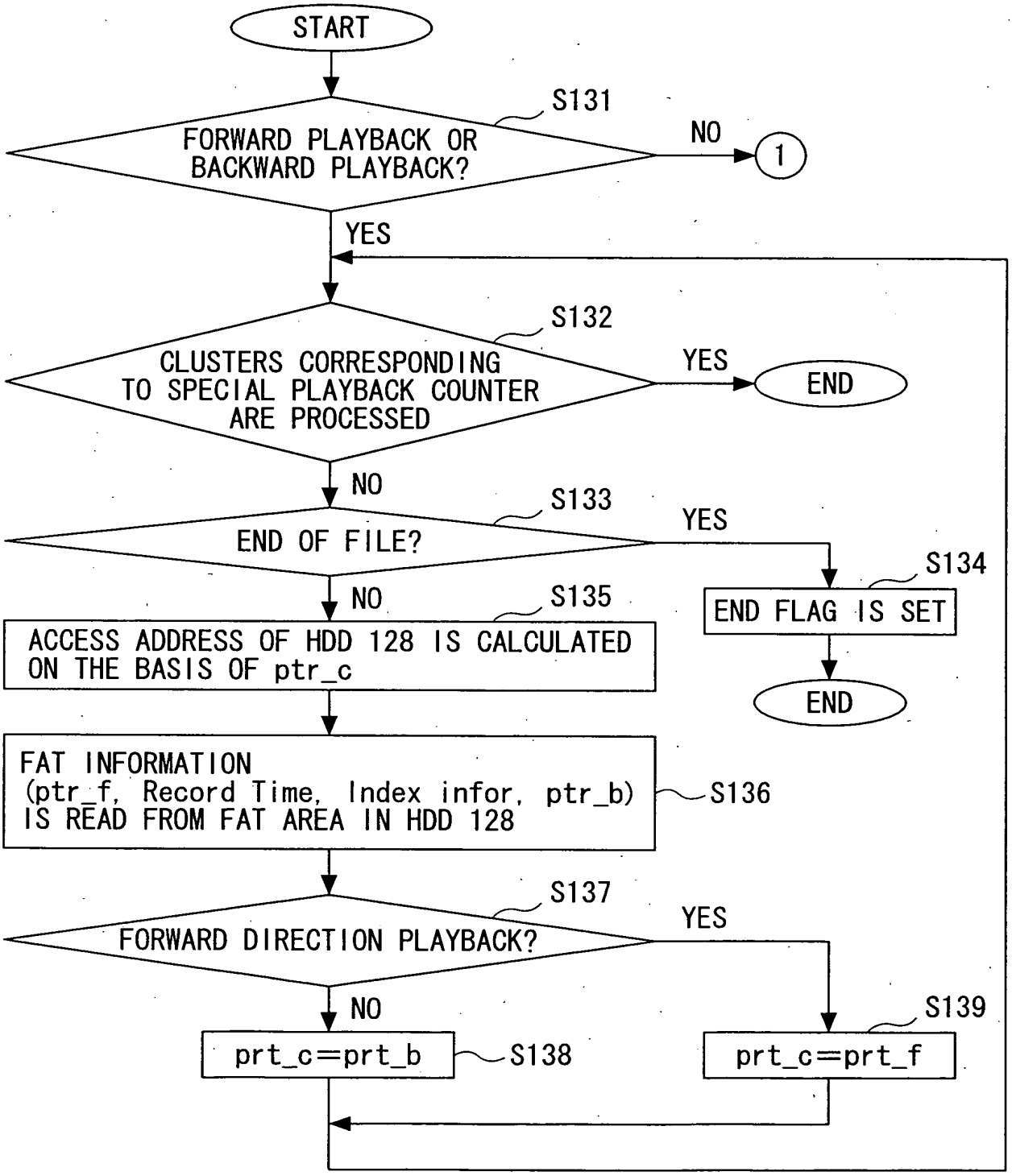

START
S131
FORWARD PLAYBACK OR BACKWARD PLAYBACK?
NO
1
YES
S132
CLUSTERS CORRESPONDING TO SPECIAL PLAYBACK COUNTER ARE PROCESSED
YES
END
NO
S133
END OF FILE?
YES
S134
END FLAG IS SET
END
NO
S135
ACCESS ADDRESS OF HDD 128 IS CALCULATED ON THE BASIS OF ptr_c
FAT INFORMATION (ptr_f, Record Time, Index infor, ptr_b) IS READ FROM FAT AREA IN HDD 128
S136
S137
FORWARD DIRECTION PLAYBACK?
YES
NO
S139
prt_c=prt_b
S138
prt_c=prt_f

FIG.24

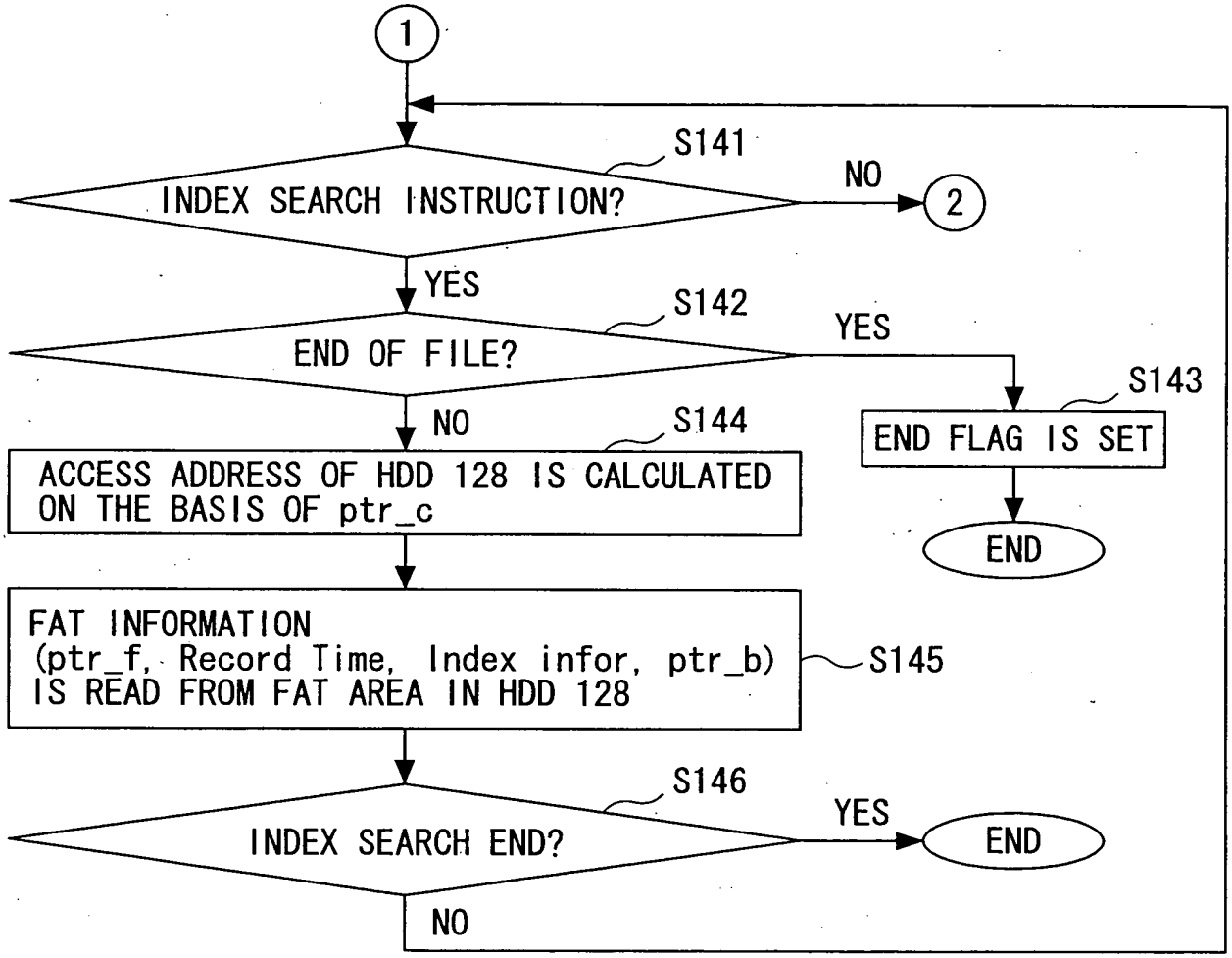
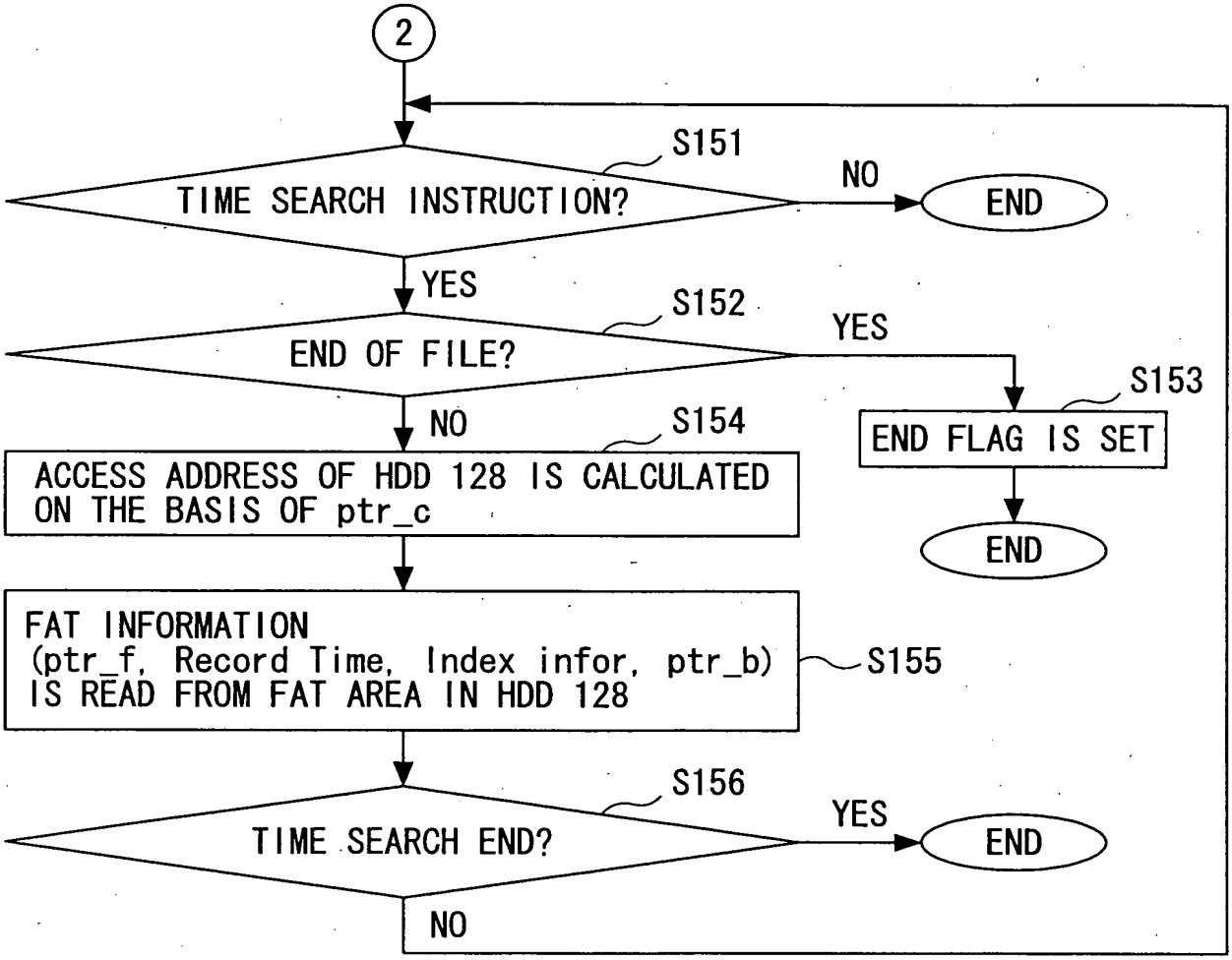

1
S141
INDEX SEARCH INSTRUCTION?
NO
2
YES
S142
END OF FILE?
YES
S143
END FLAG IS SET
END
NO
S144
ACCESS ADDRESS OF HDD 128 IS CALCULATED ON THE BASIS OF ptr_c
FAT INFORMATION (ptr_f, Record Time, Index infor, ptr_b) IS READ FROM FAT AREA IN HDD 128
S145
S146
INDEX SEARCH END?
YES
END
NO

FIG.25


2
S151
TIME SEARCH INSTRUCTION?
NO
END
YES
S152
END OF FILE?
YES
S153
END FLAG IS SET
END
NO
S154
ACCESS ADDRESS OF HDD 128 IS CALCULATED ON THE BASIS OF ptr_c
FAT INFORMATION (ptr_f, Record Time, Index infor, ptr_b) IS READ FROM FAT AREA IN HDD 128
S155
S156
TIME SEARCH END?
YES
END
NO